Space Weather Forecast

Issued on Friday, 28 April 2023 at 13:18 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

---

Space Weather Forecast Headline: Several unassessed CME candidates awaiting imagery. Else decreasing chance of G1 Minor Geomagnetic Storms through period. Chance R1 Minor/R2 Moderate radio blackouts throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity fell to low in the past 24 hours, with an overall increase in occasional Common-class X-ray activity and a peak of a long-period mid-ranking Common class flare at 28/0122UTC from a sunspot in the south-central region of the Sun. There are currently seven front-sided sunspot regions, with one having faded in the northeast only to be replaced by a new group nearer the solar meridian. Although the narrow viewing angle is precluding any analysis, there also appears to be a brightening extreme UV flux region on the southwestern solar horizon at present.

The largest and nominally most potent sunspot group on the Sun remains near the middle of the facing side, with the group responsible for the largest flare of the 24 hours lying to its immediate northwest, with some magnetic interconnection between the two considered likely.

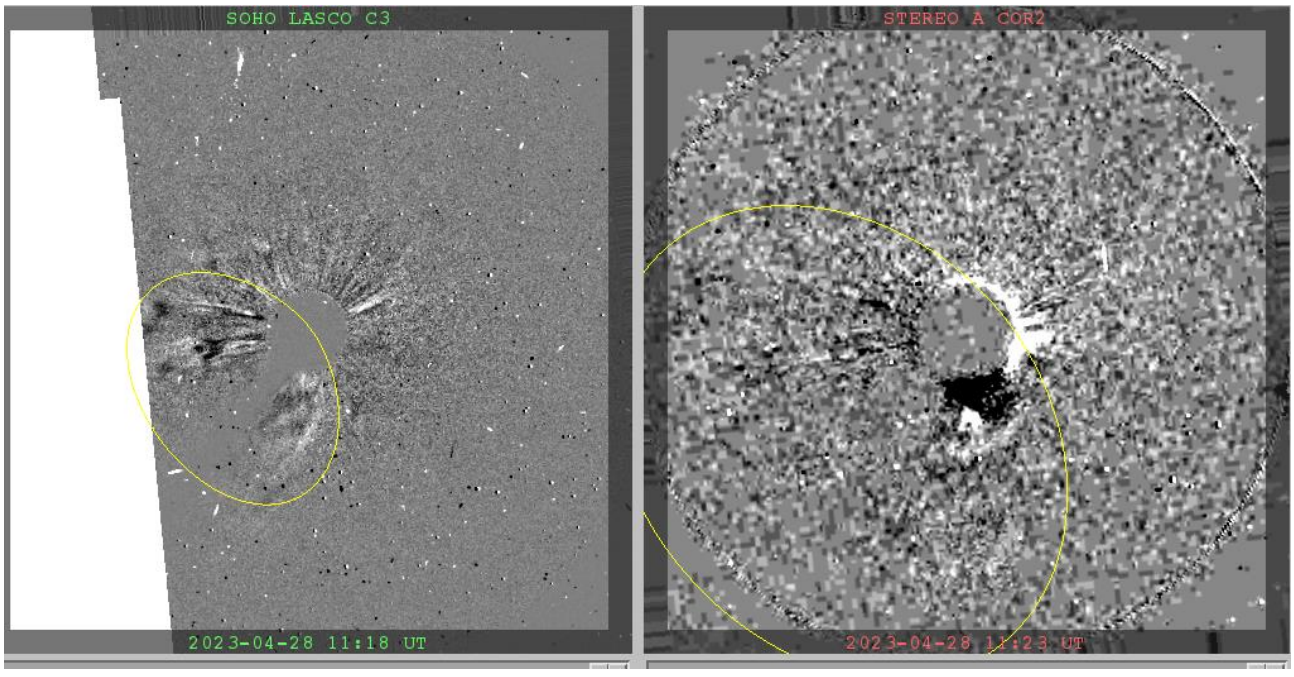

Figure 1: Satellite imagery, showing changes in neighbouring images as lighter/darker areas. Ringed in yellow are some of the possible CMEs undergoing assessment (the elipse not suggesting the left and downward portions are linked).

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2023. All Rights Reserved.

Potential Coronal Mass Ejection (CME) activity in the period has been more complex - there have been numerous fragmentary eastward-directed small CMEs in the past 48 hours, including one awaiting modelling results. None of these new eastward-directed CMEs feature in the forecast at present, but a close pass is signalled for 30 April from one of the many emitted in the UTC day of 27 April, which would prolong the risks of minor disturbances from CMEs that feature in the forecast in the run-up (i.e. the chances of glances from the 25 April and 26 April mainly southwest-directed 'filaments' loading the bases on 28 and 29 April beforehand).

Also of note on imagery were up to two mainly southward-directed CMEs becoming visible into the current UTC morning. Analysis of these events will be conducted when further imagery becomes available. Sources for the southward-heading CMEs are not definitive, but may perhaps be very tentatively correlated with the peak flare at 28/0122UTC, and perhaps a second Common-class flare around 28/0530UTC.

Rounding off a busy 24 hours, a large 'prominence eruption' (arc of plasma) left the southwest of the Sun around 28/1100UTC. There is not yet any satellite imagery for this event.

All these aspects will be monitored, but as a result, the forecast should be considered of lower than average confidence and liable to change.

Solar Wind / Geomagnetic Activity: The solar wind was mainly reflective of continuing fast wind enhancement, although this signature became less clear from 28/0800UTC given erratic traces from the measuring satellites.

The solar wind speed showed a mainly flat trend at strong levels, perhaps increasing after 0800UTC. The associated magnetic field became more erratic and of lower magnitude after this point - from a previous smooth and steady background trace. The north-south component of this magnetic field remained changeable throughout, with no lengthy periods spent anti-aligned with Earth's field (to greater geomagnetic effect). Finally, the number of particles in the solar wind was noisy, but appeared to be at long term background levels.

The net effect of the above solar wind measures was disturbed but below g1 Minor Geomagnetic Storm throughout.

Energetic Particles / Solar Radiation: No solar radiation storms were observed, with no obvious response from the Moderate-class X-ray flare that narrowly preceded this 24-hour period at 27/1113UTC from the central large sunspot group.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is likely to remain low, with a chance of reaching moderate levels. No significant regions leave and no returning regions are currently expected to rotate onto the Sun, leading to a flat trend of probabilities.

Solar Wind / Geomagnetic Activity: The current 'coronal hole' fast wind will dominate the forecast period, fading from current strong levels later in the UTC weekend. This may be overlaid by up to three CMEs, all forecast misses, but with modelling showing minor glances are possible. Respectively, these are 25, 26 and 27 April 'filament eruptions' (arcs of plasma leaving as CMEs), due to cross Earth's orbit on 28, 29 and 30 April. There are now also further unassessed candidates for CMEs that render the current forecast low confidence and subject to change - pending imagery for analyses.

The current forecast is for a chance of Minor Geomagnetic Storm G1 starting the period, falling to a slight chance by the end of the coming UTC weekend, then largely quiet into the new working

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2023. All Rights Reserved.

week.

Energetic Particles / Solar Radiation: Overall no solar radiation storms are expected, but there is a slight chance of a storm occurring over the four days - mainly due to the westward advance of the largest spot.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	30	20	10	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	30	30	30	30
Very Active	R3 to R5 X	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	5	5	5	5
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2023. All Rights Reserved.